

REMARKS

The applicants thank the Examiner for the thorough examination of the application. No new matter is believed to be added to the application by this amendment.

Entry of Amendment

Entry of this Amendment under 37 C.F.R. §1.116 is respectfully requested because it cancels a claim and places the application in condition for allowance. Alternately, entry is requested because it places the application in better form for appeal.

Status of the Claims

Upon entry of this Amendment, Claims 1-6 and 12-13 are pending in this application. Claim 11 is cancelled by this amendment. Claim 1 has been amended to incorporate subject matter cancelled from claim 13 and to also incorporate the subject matter of cancelled claim 11. Claim 12 has been amended to not depend on a cancelled claim.

Rejection under 35 U.S.C. § 103(a) over Honda

Claims 1-6 and 11-13 remain rejected under 35 U.S.C. § 103(a) as being obvious over Honda (U.S. Patent No. 5,851,700). Applicants traverse.

The Present Invention and its Advantages

The present invention pertains to a novel light-scattering sheet that has a light-scattering layer composed of wet spinodally decomposed resins that vary in refractive index and isotropically scatters light. The light scattering layer has a regular phase separation structure having at least a bicontinuous phase structure formed by wet spinodal decomposition.

The resins used excludes photopolymerizable resins by being a first resin selected from the group consisting of a cellulose derivative and a (meth)acrylic resin, and a second resin selected from the group consisting of a styrenic resin, an alicyclic olefinic resin, a polycarbonate-series resin and a polyester-series resin. Also, the inventive light-scattering layer has a ratio of a linearly transmitted light to an incident light of 0.1 to 13%. The invention is typically embodied by instant claim 1, which sets forth:

1. A light-scattering sheet comprising a light-scattering layer which comprises a plurality of resins varying in refractive index and scatters an incident light isotropically, wherein the light-scattering layer has a ratio of a linearly transmitted light to an incident light of 0.1 to 13% and has a phase separation structure having an average interphase distance of 3 to 15 μm ,
wherein the light-scattering layer has a regular phase separation structure having at least a bicontinuous phase structure formed a wet spinodal decomposition by evaporating or removing a solvent from a liquid phase containing the plurality of resins,
wherein the plurality of resins are a first resin selected from the group consisting of a cellulose derivative and a

(meth)acrylic resin, and a second resin selected from the group consisting of a styrenic resin, an alicyclic olefinic resin, a polycarbonate-series resin and a polyester-series resin.

An important aspect of the invention lies in that the light-scattering layer has a regular phase separation structure having at least a bicontinuous phase structure formed by wet spinodal decomposition. The wet spinodal decomposition is achieved by removing a solvent from a resinous liquid phase.

Distinctions of the Invention over Honda

The inability of Honda to suggest the invention has been discussed in the Amendments filed April 15, 2003, October 2, 2003 and May 26, 2004. Honda fails to disclose or suggest the claimed regular phase separation structure formed by wet spinodal decomposition.

Honda pertains to a filter for a liquid crystal display device having a diffusing plate. Claim 1 of Honda sets forth:

A method for widening a view angle of a liquid crystal display device comprising fitting a filter to a liquid crystal display device, wherein said filter comprises a light diffusing plate which is obtained by shaping into a film a composition comprising at least two photopolymerizable oligomers or monomers having refractive indexes which differ by at least 0.01 and irradiating ultraviolet light on said film of the composition, wherein the polymerizable oligomers or monomers have acrylate functional groups. (claim 1 of Honda).

The light diffusing plate of Honda is fundamentally different from that of the invention. Honda recites:

The filter comprising the light diffusing plate...is produced by utilizing a property of the composition comprising the specific photopolymerizable monomers or oligomers that they are photopolymerized and cured while causing a phase separation by the irradiation of the UV light. This method can produce the filter comprising a refractive index modulating type smooth light diffusing plate having a domain gap of 1 to 20 μm , without the use of a mask during the UV light irradiation. Since the separated phases have a continuous interface between them, no light is reflected at the interface when light passes through the obtained filter, so that the light transmission is not decreased. Since this filter does not have a structure with regularity unlike the phase lattice, it does not form any Moiré fringe. (Honda at column 4, lines 47-60).

Honda discusses resin components varying in refractive index for the light diffusing plate. Honda describes:

A specific example of a combination of the photopolymerizable monomers or oligomers is the combination of at least one component selected from the group consisting of monomers (such as 2, 4, 6-tribromophenyl acrylate, tribromophenoxyethyl acrylate, nonylphenoxyethyl acrylate, 2-hydroxy-3-phenoxypropyl acrylate, phenylcarbitol acrylate, phenoxyethyl acrylate, etc.) and oligomers such as ethylene oxide-modified bisphenol-A diepoxy acrylate, etc., and at least one component selected from the group consisting of monomers such as triethylene glycol diacrylate, polyethylene glycol diacrylate, neopentyl glycol diacrylate, 1,6-hexanediol diacrylate, etc. and oligomers such as polyol polyacrylate, modified polyol polyacrylate, polybutadiene acrylate, polyether urethane acrylate, etc. (Honda at column 3, lines 9-22).

Example 1 of Honda states:

To a polyether urethane acrylate having an average molecular weight of about 6000 (a refractive index of 1.460) (40 parts) which was obtained by the reaction of polypropylene glycol, hexamethylene diisocyanate and 2-hydroxyethyl acrylate, 2, 4, 6-tribromophenyl acrylate (a refractive index of 1.576) (30 parts), 2-hydroxy-3-phenoxypropyl acrylate (a refractive index of 1.526 (30 parts), and 2-hydroxy-2-methylpropiophenone (1.5 parts) as a photopolymerization initiator were added and mixed to prepare a photopolymerizable composition. (Honda at column 6, lines 6-15).

Regarding the structure of the light diffused-plate (which is fundamentally different from that of the invention), Honda recites:

The filter comprising the light diffusing plate...is produced by utilizing a property of the composition comprising the specific photopolymerizable monomers or oligomers that they are photopolymerized and cured while causing a phase separation by the irradiation of the UV light. This method can produce the filter comprising a refractive index modulating type smooth light diffusing plate having a domain gap of 1 to 20 μm , without the use of a mask during the UV light irradiation. Since the separated phases have a continuous interface between them, no light is reflected at the interface when light passes through the obtained filter, so that the light transmission is not decreased. Since this filter does not have a structure with regularity unlike the phase lattice, it does not form any Moiré fringe (Honda at column 4, lines 47-60).

In respect to the light-scattering property of the light diffused-plate, Honda states:

A selective diffusing property of the light diffusing plate in relation to the incident angle of light is defined by a haze of the plate in relation to the incident angle of light.

Preferably, the light diffusing plate...has a property of changing the haze depending on the incident angle of light, and both a light incident angle range with a light diffusing ability of a haze of at least 30% (a diffusing angle range) and other light incident angle range without a light diffusing ability...the maximum haze of the light diffusing plate is preferably in the range between 30% and 85%. (Honda at column 4, lines 29-42).

Furthermore, "When the filter comprising the light diffusing plate...is fitted to the light emitting side of the liquid crystal display device, it is preferably assembled in a laminate by inserting it between the outer surface of the device and a transparent substrate." (Honda at column 4, line 66 to column 5, line 3).

Honda, however, fails to teach or suggest a phase separation structure formed from specific thermoplastic resins that excludes photopolymerizable resins, by wet spinodal decomposition and having a specific light-scattering capacity. Honda further fails to teach or suggest the claimed 0.1-13% ratio of transmitted light.

The light diffusing plate of Honda essentially contains photopolymerizable resin, and the resins of Honda are thus fundamentally different from those used in the invention. Thermoplastic resin is remarkably different from photopolymerizable resin in such properties as flowability, compatibility, polymerization mechanism, and the molding or shaping process. Honda, that is, provides no motivation to use thermoplastic resins.

Also, the plate of Honda is different from the light-scattering layer of the present invention in not only process and materials, but also in light scattering properties. Since a haze of between 30% and 85% in the plate of Honda corresponds to a ratio of linearly transmitted light to incident light of 15 to 70%, the ratio of linearly transmitted light of Honda is higher than that of the present invention (0.1 to 13%, see claim 1).

Unexpected advantages can be obtained from the present invention. Since the light diffusing plate of Honda contains a photopolymerizable resin, a curing process involving irradiation by UV light is required to produce Honda's plate. The irradiation conditions (such as irradiation time and intensity) or the control of the phase separation (such as by timing the irradiation) must be rigorously controlled in order to produce a plate having a regular phase structure. Further, since the plate of Honda has a high ratio of linearly transmitted light to incident light, a high directionality cannot be imparted to the transmitted light. Thus, the display surface of Honda cannot be further improved to have uniform brightness.

On the other hand, the present invention produces a light-scattering layer having a regular phase separation structure that can be produced by a simple wet spinodal decomposition (evaporating a solvent) without resorting to the complicated process of irradiating UV light. Further, since the layer of the present invention has a low ratio of linearly transmitted light to

incident light and a specific light scattering property, the directionality can be imparted to a transmitted light effectively, and a display surface having uniform brightness can thus be attained.

Accordingly, Honda fails to disclose or suggest i) regularity of phase separation structure, ii) wet spinodal decomposition, and iii) the claimed light transmittance ratio. Although Honda discloses photopolymerization and curing with the UV light, Honda fails to teach or suggest wet spinodal decomposition by evaporating or removing a solvent from a liquid phase, and the advantages to be thus obtained.

Additional distinctions of the invention over Honda have been set forth in previous responses. For brevity, these distinctions have not been repeated here

A person having ordinary skill in the art, as a result, would not be motivated by Honda to produce the invention as is embodied by claim 1. Claims dependent upon claim 1 are patentable for at least the above reasons. Thus a *prima facie* case of obviousness has not been made over Honda.

This rejection is accordingly overcome and withdrawal thereof is respectfully requested.

Conclusion

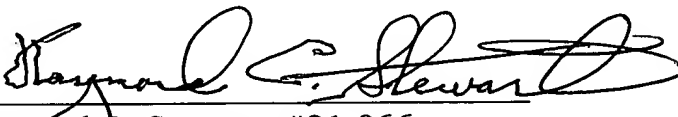
Should there be any outstanding matters that need to be resolved in the present application, the Examiner is respectfully requested to contact Robert E. Goozner, Ph.D. (Reg. No. 42,593) at the telephone number of the undersigned below, to conduct an interview in an effort to expedite prosecution in connection with the present application.

Pursuant to 37 C.F.R. §§ 1.17 and 1.136(a), Applicant(s) respectfully petition(s) for a one (1) month extension of time for filing a reply in connection with the present application, and the required fee of \$110.00 is attached hereto.

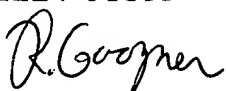
If necessary, the Commissioner is hereby authorized in this, concurrent, and future replies, to charge payment or credit any overpayment to Deposit Account No. 02-2448 for any additional fees required under 37 C.F.R. §§ 1.16 or 1.17; particularly, extension of time fees.

Respectfully submitted,

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